

SUMMARY OF THE INVENTION

The present invention brings revolutionary concepts to the field of stress testing:

5 utilizing a virtual oven, sharing test equipment, and logically grouping components and modules to be tested provides many distinct advantages over the prior art.

In general, the inventive systems and methods solve the problem of massive manual management of the following: a) process control, b) data, c) active signal controls, and d) product performance verification for stress testing. This goal was

10 accomplished by designing, developing, and making operational an Automated Monitoring System (AMS). AMS communicates to modules and test equipment that are undergoing and performing stress testing as well as collecting the data automatically.

15 Stress testing according to one aspect of the invention includes exposing operating equipment/modules to thermal stress (or other stressor(s)) over a long (e.g. 48 hour) period of time including an (e.g. 24 hour) active test such as a bit error rate test (BERT) for optically tested modules (e.g. transmitters, receivers, remodulators, selectors, transceivers, variable optical attenuators, and amplifiers). The stress tests may also involve introducing noise to the test signal and/or degrading the test signal strength. The invention is capable of testing a wide variety of other components including electronic, 20 opto-electronic, and optical components.

The inventive stress-testing process is a critical component of the manufacturing flow for producing reliable modules because the invention:

- Reveals module damage due to handling (e.g. electrostatic discharge or other handling related damage).
- Virtually simulates field conditions over a broad range of temperatures, operating conditions, and signal conditions.
- Deliberately ages the product so as to eliminate substantially all early life failures from the product shipped to the customer.

More specifically, virtual oven for stress testing a plurality of modules includes a logical group of modules loaded into an environmental stress screening room wherein an environmental stress parameter of the environmental stress screening room changes over time; a test equipment operatively connected to the modules of said logical group, said test equipment generating a test signal and capable of performing an active test of at least one of the modules of said logical group at a time; and a controller operatively connected to said test equipment and to said logical group of modules; said controller receiving results of the active test performed by said test equipment

The modules may also include sensors or other devices for measuring parameters of the module and the controller may receive passive test measurement values from these sensors. In this way, a passive test of the modules may be performed independently of and simultaneous with the active testing. The results of the active test and the passive test measurement values for each of the modules are associated with the module and stored in a database.

Furthermore, the controller may send a command to at least one module of the logical group to, for example, place that module in a desired operational state, exercise the module, or otherwise assist in the testing regime.

Moreover, a network may be used to operatively connect the test equipment with 5 the controller, the memory device, and each of the modules of the logical group. The invention also includes a system of virtual ovens that may be connected via a network.

The inventive methods for stress-testing a plurality of modules includes designating a logical group of modules in an environmental stress screening room wherein an environmental stress parameter of the environmental stress screening room 10 changes over time; generating a test signal; supplying the test signal to at least one of the modules of the logical group to subject the at least one module to an active test thereof; and receiving results of the active test from one of the modules of the logical group with a test equipment.

The method may perform a series of tests of the logical group modules on a time-share basis with the test equipment. In addition, the method may further include 15 receiving passive test measurement values from at least one of the modules of the logical group; analyzing the passive test measurement values and the active test results; and displaying results of said analyzing step.

Moreover, the invention encompasses a method of asynchronously conducting 20 stress testing on a plurality of groups modules including a first and second logical groups of modules. This method asynchronously initiates testing of the first and second logical groups of modules; tests the first logical group of modules with the first test equipment; and tests the second logical group of modules with the second test equipment,